

Information Science and Technology Center Seminar Series



Randy Bryant
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"Data-Intensive Scalable Computing: Finding the Right Programming Models"

Wednesday, March 9, 2011
3:00 - 4:00 PM

TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Web search engines have become fixtures in our society, but few people realize that they are actually publicly accessible supercomputing systems, where a single query can unleash the power of several hundred processors operating on a data set of over 200 terabytes. With Internet search, computing has risen to entirely new levels of scale, especially in terms of the sizes of the data sets involved. Google and its competitors have created a new class of large-scale computer systems, which we label "Data-Intensive Scalable Computer" (DISC) systems. DISC systems differ from conventional supercomputers in their focus is on data: they acquire and maintain continually changing data sets, in addition to performing large-scale computations over the data.

With the massive amounts of data arising from such diverse sources as telescope imagery, medical records, online transaction records, and web pages, DISC systems have the potential to achieve major advances in science, health care, business, and information access. DISC opens up many important research topics in system design, resource management, programming models, parallel algorithms, and applications. DISC points the way to new ways of organizing large-scale computing systems to be more robust, scalable, and cost effective than are current high-performance computing systems.

Programs for DISC systems must be written in ways that allows them to be executed in a loosely-coupled asynchronous environment, such as the Map/Reduce framework pioneered by Google. Although Map/Reduce has surprisingly broad applicability, a richer set of programming languages and models is required to realize the full potential of DISC.

Biography: Randal E. Bryant is Dean of the Carnegie Mellon University School of Computer Science. He has been on the faculty at Carnegie Mellon since 1984, starting as an Assistant Professor and progressing to his current rank of University Professor of Computer Science. He also holds a courtesy appointment in the Electrical and Computer Engineering Department.

Much of Dr. Bryant's research has focused on methods for formally verifying digital hardware, and more recently some forms of software. His 1986 paper on symbolic Boolean manipulation using Ordered Binary Decision Diagrams (BDDs) has one of the highest citation count of any publication in the computer science literature. More recently, he has become interested in the opportunities and challenges presented by computer systems working with very large data sets.

Dr. Bryant has received widespread recognition for his work. He is a fellow of the IEEE and the ACM, as well as a member of the National Academy of Engineering and the American Academy of Arts and Sciences. His awards include the 2007 IEEE Piore Award, the 1997 ACM Kanellakis Theory and Practice Award (shared with Edmund M. Clarke, Ken McMillan, and Allen Emerson) for contributing to the development of symbolic model checking, as well as the 1989 IEEE W.R.G. Baker Prize for the best paper appearing in any IEEE publication during the preceding year. In the field of electronic design automation, he has won both the IEEE/CEDA Phil Kaufman Award and the ACM/IEEE A. Richard Newton technical impact award.

Dr. Bryant teaches courses in computer systems. Along with David R. O'Hallaron, he developed a novel approach to teaching about the hardware, networking, and system software that comprise a system from the perspective of an advanced programmer, rather than from those of the system designers. Their textbook "Computer Systems: A Programmer's Perspective" is now in its second edition and is in use at over 150 universities worldwide, with translations into Chinese and Russian.

Dr. Bryant received his B.S. in Applied Mathematics from the University of Michigan in 1973, and his PhD from MIT in 1981. He was on the faculty at Caltech from 1981 to 1984.



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For more information contact the technical host Frank Alexander, fja@lanl.gov, 665-4518. If you wish to schedule an appointment with Dr. Bryant please contact Josephine Olivas, jojo@lanl.gov, 663-5725.
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